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SCIENCE NEWS LETTER

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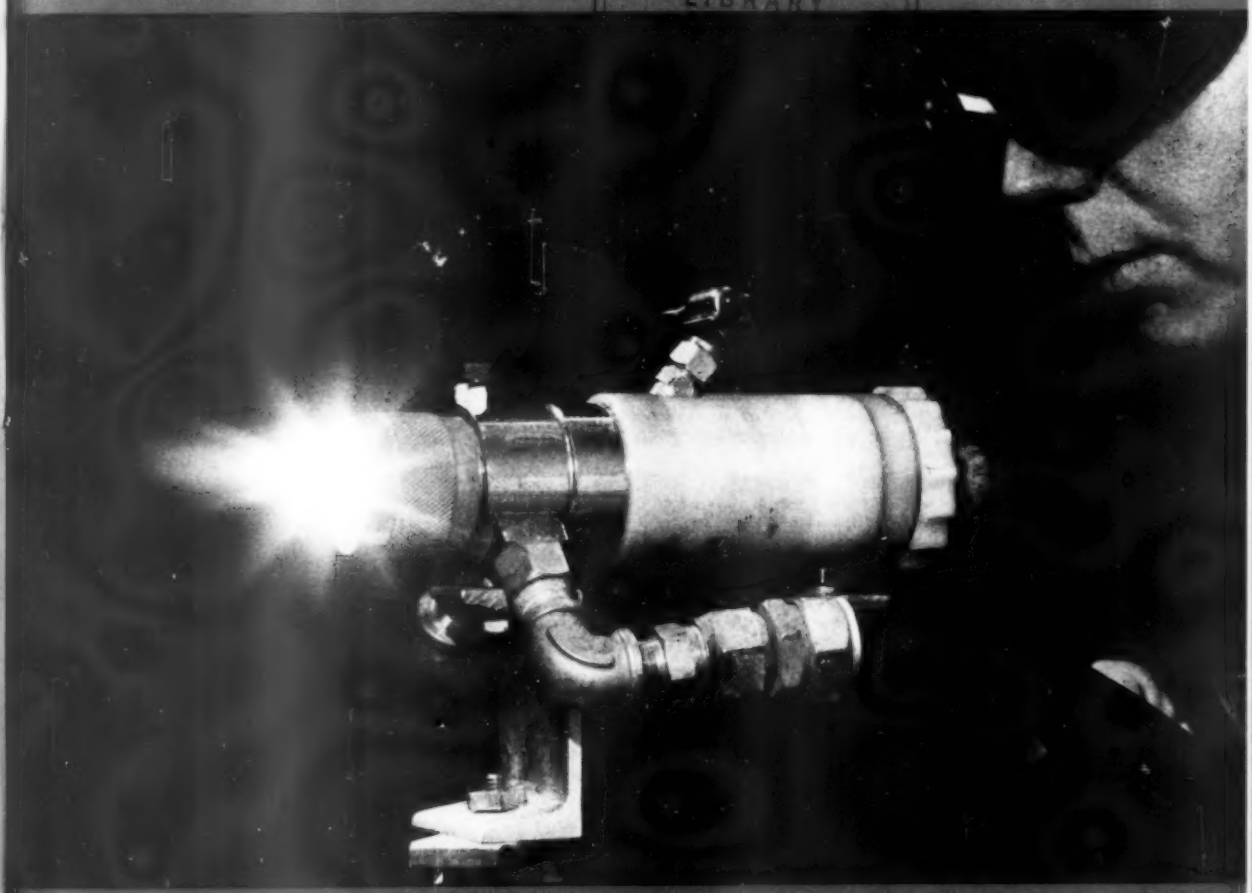

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Miniature Rocket

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A SCIENCE SERVICE PUBLICATION

ROCKETS AND MISSILES

Atomic Rocket Cheaper

SATURN ROCKETS equipped with two atomic stages could do the job of a multi-million dollar Nova rocket at only half the cost, a new study shows.

The Atomic Energy Commission released the study. It shows that the Saturn, a super-rocket for space research, could be greatly souped up. Saturn is planned as a five-stage rocket and is scheduled for completion in 1964.

The report says that with its top four stages replaced by two atomic stages, Saturn would have:

1. Four times the payload capability of the five-stage Saturn.

2. The same payload capability as the four-stage Nova, a giant super-rocket proposed as Saturn's successor.

The study shows Nova would cost $48,000,000. The modified Saturn would cost $24,000,000. The modified Saturn might also be more reliable because it would have only three stages that could malfunction. Nova would have four.

In recent testimony before a House of Representatives subcommittee, Dr. Wernher Von Braun said planning has already begun on a Saturn with a single nuclear stage. The German-born scientist predicted that the super-rocket would be tested in flight in 1968 or 1969.

U.S. Air Force Lt. Col. Howard R. Schmidt and Maj. Ralph S. Decker, both attached to the AEC's aircraft reactor section in Washington, D. C., prepared the new AEC report. Col. Schmidt is chief of the section's missile project branch. He and Maj. Decker say a nuclear-chemical Saturn could be produced in 15 years.

They say the modified Saturn could lift a 36,000-pound payload for a soft landing on the moon. The cost per pound of payload delivered "would be $1,600 per pound for the all-chemical Saturn, $1,400 per pound for the Nova and $700 per pound for the chemical-nuclear Saturn."

In the modified Saturn, the two nuclear stages would each have a nuclear reactor that would produce great heat. The heat would make liquid hydrogen expand and rush out through a nozzle at the rear of the engine.

The AEC began a study of nuclear rockets in 1955. It is now jointly sponsored by the National Aeronautics and Space Administration under the name, "Project Rover."

The first Project Rover reactor experiments were completed last summer. Conducted at Jackass Flats in Nevada, the experiments tested a prototype nuclear rocket named Kiwi-A after the Australian bird that cannot fly.

Kiwi-A cannot fly either but information provided by its testing may help design reactors that can. This summer, more rocket reactor experiments are planned.

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ROCKETS AND MISSILES

Particles Hit Pioneer V

WHEN A GIGANTIC solar flare burst into space on March 30, Pioneer V was hit by its hot particles and sent information on the effects back to earth. Simultaneously, scientists on earth obtained the same data from high altitude balloons.

Thus scientists have been able to correlate information from the balloons, earth satellites, and Pioneer V, the solar satellite, with great success, scientists of the National Aeronautics and Space Administration, the University of Chicago and the State University of Iowa reported to the American Geophysical Union meeting in Washington, D. C.

Dr. J. A. Simpson of the Enrico Fermi Institute for Nuclear Studies, University of Chicago, described the solar bursts and their impact on the earth.

He said a huge solar storm on March 30 resulted in bombardment of the earth by radiation.

The particles in this radiation were accelerated after they entered the earth's atmosphere, giving off intense radiation.

Dr. Simpson said that one of the most outstanding recorded events occurred April 1 when protons were observed entering the earth's atmosphere at the poles. At the same time electrons coming from the sun were observed.

Dr. C. P. Sonett, director of the space physics section, Space Technology Laboratories, Inc., Los Angeles, reported that a ring current of particles circles the earth, centered about 40,000 miles from the earth's center. This ring, about 24,000 miles across, affects the earth's magnetic field. It has been observed by both Explorer VI and Pioneer V, in two different parts of space, Dr. Sonett said.

Whenever disturbances due to solar activity occur on earth, corresponding disturbances have been observed in space, Dr. Sonett reported. This makes current theories explaining how such effects occur questionable, Dr. Sonett said.

He concluded that information from Pioneer V and the Explorer satellites have accomplished two objectives: extended man's knowledge of space, and given new information on interplanetary space.

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ROCKETS AND MISSILES

175 Research Rockets Reported Fired by USSR

RUSSIA LAUNCHED 125 research rockets during the International Geophysical Year, plus 50 more in 1959, a report from Nice, France, indicates. Some of the rockets had payloads up to 4,850 pounds.

The launching of these rockets took place in the Soviet Union, in the Polar Zone and from a ship in the Southern Hemisphere and the Northern Pacific. Many indications of the constitution and composition of the upper atmosphere were reported obtained with the experiments.

According to Russian sources, the studies showed electron concentration varies with the time of day and season in the outer part of the ionosphere. This may be an important factor in radio reception, because the electrified layers reflect radio signals, thus making broadcasts possible over long distances.

The Russians also found that there are very high concentrations of electrons at least 290 miles above the earth.

Of the rockets, 158 were for studying weather. In some cases the luminosity of the sky and the distribution of ozone were studied. New data on temperatures and pressures in the stratosphere—the middle layer of atmosphere—were collected.

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ROCKETS AND MISSILES

Small Rocket Tested For Moving Satellites

See Front Cover

A MINIATURE rocket designed to maneuver satellites about in space has successfully operated for 47 hours in a test reported to the U. S. Air Force, which supported the testing program.

No bigger than a milk bottle, the power plant weighs only three and a half pounds, without fuel. It is an arc jet engine.

It gets its thrust from a gas (hydrogen or helium) that is heated by passing it through an electrostatic field. The heated gas expands and hurtles out the rocket's nozzle as seen on the cover of this week's SCIENCE NEWS LETTER.

The experimental rocket tested used helium as a working fluid and was operated in a near vacuum. The total velocity increase that the rocket could have given a vehicle in space was about 4,000 feet per second. It could do this because a satellite balanced in orbit can be shifted by relatively small amounts of continuous power over a period of hours or even days.

(The movement of a vehicle after it is lifted into space is very different from lifting it from ground into space. The latter requires great thrust for a few minutes.)

A nuclear source or solar batteries could provide the arc engine with electricity. A tank of liquid hydrogen or helium would be required to supply fuel. Thus, though the engine itself is light, fuel for months of operation would weigh many hundreds of pounds.

Tests were made by the new rocket's developer, Avco's Research and Advanced Development Division of Wilmington, Mass.

During the tests, the engine produced nearly three-fourths of a pound of thrust at specific impulse of 1,000 seconds with a power input of 30 kilowatts. Specific impulse is the rocket engineer's equivalent of miles-per-gallon. Specific impulses of about 250 seconds are about the current average.

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BIOLOGY

Radiation Harms Embryo

Irradiation of mice embryos during first 24 hours after conception produced high number of abnormal females. Very early development of mice embryos is much like that of humans.

WOMEN who might be pregnant should avoid any unnecessary exposure to radiation, especially during the first 24 hours after possible conception.

Present information indicates there is no lower limit to the amount of radiation beyond background level that could cause inherited damage.

Mice exposed to radiation die earlier and from different causes than those experiencing only the natural background radiation.

These three conclusions concerning the effects of radiation were among those drawn from studies reported to the National Academy of Sciences meeting in Washington, D.C., by scientists from the biology division of the Atomic Energy Commission's Oak Ridge National Laboratory in Tennessee.

Dr. Liane Brauch Russell, explaining results of studies of radiation on mice to a news conference, said if women who might become pregnant need X-ray or other radiation treatment, they should get the treatment during the very early part of the menstrual cycle, when conception is less likely to be in progress. During the 24 hours following conception, the fertilized egg cell is particularly sensitive to changes resulting from many factors, and radiation is one of these factors, Dr. Russell's studies with Dr. Clyde L. Saylors have shown.

The amount of change caused by natural background radiation, including fallout, she said, would be much too low to cause the abnormalities in embryos they have observed when the mice were subjected within 24 hours after conception to 100 roentgens, which is a high radiation dose. Other factors could also affect the chromosomes within the first 24 hours, Dr. Russell reported.

The development of human embryos closely follows that of mice day by day for about the first week.

Drs. Russell and Saylor studied the occurrence of the so-called XO sex chromosome in mice. Normally, in mammals, the female possesses two X-chromosomes, and the male possesses one X and one Y chromosome. However, some mice possess only one X chromosome, without a partner, and they are females. These are called the XO constitution.

Human females lacking one sex chromosome, that is, with an XO constitution, are badly stunted in their sexual development and may suffer from a number of other abnormalities. Drs. Russell and Saylor showed that irradiation during the first 24 hours after conception produced a very high proportion of XO females in mice. Within the 24-hour period between fertilization and the first cleavage division of the individual, the highest frequency of XO individuals occurred relatively early.

Dr. Russell also reported that the irradiation produced, for the first time, the loss of a maternal X-chromosome. All previous recorded cases have been for paternal sex chromosomes.

Her husband, Dr. W. L. Russell, reported that mice receiving a radiation dose as low as 10 roentgens per week still had higher mutation rates than controls receiving only background radiation. This is the lowest dose yet tried in experimental work on animals, Dr. Russell said. All other low dosage studies have been on the mature cells, but Dr. Russell and Dr. Elizabeth M. Kelly worked for the first time on early cell stages.

Their preliminary results of studies on some 40,000 mice indicate there is no so-called threshold dose of radiation below which no damage will be caused. The new information supports earlier findings that a given dose of chronic radiation is less genetically damaging than the same dose of radiation given at a much higher rate.

Drs. A. C. Upton and A. W. Kimball, also of Oak Ridge, have found that radiation doses given over a long period of time have much less effect in shortening the life span of mice than the same dose given at one time.

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SHAPE RECOGNIZER—Leon D. Harmon, scientist of Bell Telephone Laboratories, New York, demonstrates his invention for recognizing different shapes. The light above shines on the drawing of a square which is "recognized" by a scanner below the clear plastic table. The tiny lighted square in the back panel of the machine indicates that the shape has been identified as a square.

ANATOMY

Cockroaches Control Mating With Brains

COCKROACHES control their mating and reproduction cycles with their brains.

This "intellectuality" has been observed by Dr. Franz Engelmann, German anatomist now conducting research at Albert Einstein College of Medicine in the Bronx. Dr. Engelmann has studied the control of egg maturation in *Leucophaea maderae*, a cockroach of African origin now indigenous to many of New York's slum areas.

Two bodies called corpora allata behind the roach's brain serve to stimulate its sex glands just as the anterior part of the pituitary does for humans, he told the New York Academy of Sciences. As in humans, Dr. Engelmann said, a hormone does the job, but he does not yet know its nature.

If you deprive the female cockroach of food, he said, her brain sends a message to the corpora allata that makes them halt the maturation of eggs. With this damping down of the hormone production, the female also becomes less responsive to the male and mating.

Dr. Engelmann said his research on cockroach reproduction is part of a program at Einstein College of Medicine that is designed to compare the sexual-reproductive mechanisms of various insects, mammals and other animals.

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MILITARY SCIENCE

Nuclear Test Ban Urged

VERY LITTLE military power would be lost for the United States if an agreement were made with the Russians to halt nuclear tests, Dr. Hans Bethe, the scientist who worked out the method that keeps the sun stoked—also the basis for the hydrogen bomb—urged.

Dr. Bethe, a Cornell University physicist who was a member of the U.S. negotiating team at Geneva, said he considers a treaty to halt tests "very worthwhile." A political decision to run the "rather small risk" of cheating against the inspection system is needed, however, before agreement can be reached, Dr. Bethe said.

He said a treaty to stop nuclear tests might keep other nations from joining the nuclear club in which the U.S., USSR, Great Britain and France are now members.

Although it has been argued that the U.S. cannot afford to have the Russians cheat on a test ban, Dr. Bethe said the U.S. can even less afford resumption of tests. If tests were resumed, he argued, the Russians will develop those weapons of greatest use to them—probably large strategic weapons to threaten our homeland, as well as small tactical weapons.

The alternative of not reaching agreement and of breaking off negotiations would set back the general cause of disarmament enormously, Dr. Bethe said. However, a nuclear test ban agreement might be followed by others of a more worthwhile type, such as limitation of the number of missiles and atomic warheads.

Both the U.S. and Russians have been very hard negotiators, Dr. Bethe reported. He warned that the Russians may come to a point at which they consider further negotiations futile and revert to the tough Stalin line in foreign policy.

One major point the Russians have accepted is the principle that there should be a control system, Dr. Bethe said. Originally, detection of nuclear tests seemed a simple problem. However, negotiators were forced to consider increasingly more difficult situations and increasingly more determined violations.

The Russians, Dr. Bethe reported, were "amazed" at the idea of the "big hole"—the exploding of bombs in deep caverns so that the shock waves travel through air before entering the earth's rock layers, thus cutting down the chances of detection by seismic methods.

Dr. Bethe said he was "embarrassed" to present the theory of muffling nuclear explosions at Geneva because this implied the U.S. considered the Russians capable of cheating on an enormously massive scale. No system will ever be entirely foolproof, and Dr. Bethe questioned whether the U.S. should worry about tests so small they could not be detected by the agreed methods.

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TECHNOLOGY

Dialdehyde Starch Aids Paper's Wet Strength

PAPER with increased wet strength has resulted from a new method of treating paper pulp with dialdehyde starch, made from corn, wheat or grain sorghum.

Scientists of the U. S. Department of Agriculture have found that dialdehyde starch at levels of 0.5% to 2.5% in pulp produced papers with excellent wet strength and with better dry strength than that of untreated paper.

Uses for wet strength paper include paper toweling, toilet and facial tissue, outdoor posters, shipping sacks, grocery bags, frozen food wrappers, and photographic and filter papers.

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PSYCHOLOGY

Speaking Equal to Thinking

SPEAKING and thinking have about the same function for human beings.

Both require the ability to handle abstractions, Dr. Kurt Goldstein of the New School of Social Research in New York told a conference on the Fundamentals of Psychology sponsored by the New York Academy of Sciences.

Both speaking and thinking follow laws of their own that become effective differently according to the requirements, he said. He based his conclusions on results of his study and treatment of patients with damage to the brain cortex.

In language and thinking, we must consider an active kind determined by the individual capacity of abstraction, and a passive kind made by the use of abstraction. The passive use of language and thinking is more and more automatic, prompted by stimulation both from the outside world and from inside the person.

Neither speaking nor thinking can come to full development alone. The disturbance of one manifests itself also in modification by the other, Dr. Goldstein said.

The impulse to speech always comes from thinking. Even if outside events stimulate a person to speak, thinking still plays a dominant part. During active thought, the processes that stimulate a person to speak and to store fixed thoughts, become active.

Although words are used to "jell" thoughts, language is not just a substitute for thinking. Language has a function of its own, said Dr. Goldstein. It enriches man's behavior and makes possible the higher form of self-fulfillment which is essentially different from that in animals.

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Creativity Must Be Free

CREATIVE THINKING is helped by doing the whole job rather than by extreme division of labor.

This was reported in New York by Dr. Abraham S. S. Luchins of the University of Florida, Miami, to a conference on the psychology of thinking, sponsored by the New York Academy of Sciences.

A relatively high degree of freedom of action is also involved in creative production, he said.

Yet while creativity is highly individual, it is also a social concern. Society helps determine what will be considered creative.

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Genius Needs Recognition

A GENIUS, in order to be one, must be recognized as such by society. Creative thinking must be recognized by others as having practical or aesthetic value to be meaningful, Dr. Livingston Welch, of Hunter College, New York, told the conference on the psychology of thinking, sponsored by the New York Academy of Sciences. He said that the machinery involved in creative thinking is much the same as that of simple problems of everyday life or in the very often original thinking of the insane mind.

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PSYCHOLOGY

Vocabulary Loss Follows Operation on Brain

BRAIN SURGERY of the type called topectomy used in the treatment of mental illness causes a loss of ability to understand words, Dr. Roy M. Hamlin of the University of Pittsburgh and Dr. Elaine F. Kinder of Rockland State Hospital, Orangeburg, N. Y., reported to the Midwestern Psychological Association meeting in St. Louis.

In the operation 35 grams of tissue was removed from the frontal lobes of both sides of the brain. The operation did not affect the area of the brain known to control speech. The vocabulary loss showed up on tests given the patients ten years after the operation. A comparison group of patients who were not operated on showed a vocabulary gain during the same period.

The loss in the operated patients was not large but it was statistically significant in relation to the comparison group who had all gained in knowledge of words. The 40 operated patients studied were all suffering from schizophrenia, the most common of the mental diseases. They had been in the Rockland State mental hospital for 12 years. All could read and write.

15 NUCLEAR TONS—A test package representing one section of a nuclear power plant, weighing 15 tons, is loaded into a C-130A aircraft at The Martin Company's airport in Baltimore. The plant is being built by Martin for the U.S. Atomic Energy Commission and will be installed next year at Sundance Air Force Station, Wyoming.

This finding of vocabulary loss confirms similar past findings on men whose brains were injured by gunshot wounds in the war or by accident.

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PSYCHOLOGY

Guess Car Speed Slower Than It Actually Is

A POLICEMAN following your car on the highway may be able to tell accurately whether you are going faster or slower than he is, but the policeman's tendency will be to underestimate your actual speed rather than overestimate it.

This is indicated by Drs. Paul L. Olson and Herbert J. Bauer of General Motors' Research Laboratories on the basis of experiments using experienced drivers, not policemen. They reported their findings to the Midwestern Psychological Association meeting in St. Louis.

The experienced drivers drove at 40 miles an hour while a car ahead of them moved at various speeds, accelerating in ten-mile jumps to speeds as high as 70 miles an hour.

The gap between the two cars was set at one-tenth or two-tenths of a mile, and drivers in the following cars were asked to judge the speed of the leading car. Results showed that the drivers could judge accurately whether the distance between the two cars was increasing or decreasing. About 40% were able to judge the speed of the leading car accurately. The evidence indicated that most people, however, tended to underestimate the speed of a leading car.

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PSYCHOLOGY

Different Personalities Work Better Together

A SMALL WORK GROUP can reach a better solution for a problem if the individuals working together have quite different personalities than if they are alike, Drs. L. Richard Hoffman and Norman R. F. Maier of the University of Michigan told the Midwestern Psychological Association meeting in St. Louis.

This was learned when the psychologists set up 41 four-person groups to work out solutions for problems. In picking persons for 16 of the groups, they selected people who were alike in performance on a temperament test. Another 25 groups were composed of persons who scored differently.

A larger proportion of high-quality solutions were turned in by the groups containing different personalities. Mixed groups did better than all-male groups. And the quality of solutions by like-minded people appeared to get worse as the people continued to work together.

Group members were asked to report how well satisfied they were with the solutions reached. Satisfaction with the decisions, it was found, depends more on the amount of influence they felt they had on the decision rather than on the quality of the solution.

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MEDICINE

Drug Can Check Diabetes

THERE IS NO immediate cure for diabetes, despite hopeful statements in Congressional hearings that the tendency toward this disease can be reversed if caught early enough.

Dr. Riley Thomas of Howard University Medical School, Washington, D. C., who has been testing an oral anti-diabetic drug for three years, reported that results show a six-week treatment will protect a person for about 18 months if the diabetic tendency is caught early enough. (See SNL, 72:19, 1957)

However, in practice, he said, the person probably would take regular amounts of the oral drug.

Dr. Thomas' experiments on tolbutamide, produced as Orinase by the Upjohn Company, Kalamazoo, Mich., are among several being conducted here and abroad. Studies at the University of Michigan indicate that the drug keeps diabetes under control by increasing the pre-diabetic's tolerance of sugar.

About 2,900,000 Americans are diabetics. Nearly half of these are undetected cases who are not getting treatment. If the disease is to be stopped, early detection is essential.

The injectable form of Orinase, produced for experimental purposes only, has shown promise as a simple test for diagnosing diabetes, especially early, mild cases. An injection of Orinase reduces blood sugar levels of non-diabetics in 30 minutes. If the suspect is diabetic, the time required is more than an hour.

In addition to checking and detecting diabetes, Orinase has also saved the lives of unborn babies.

It is generally known that women with uncontrolled diabetes often miscarry or give birth to abnormal babies, many of them stillborn or with congenital defects. Dr. W. P. U. Jackson of the University of Capetown, South Africa, found that even before overt diabetes developed, prediabetic mothers gave birth to abnormally large babies and nearly half were stillborn or died soon after birth.

Dr. Jackson treated the pregnant women as though they were frankly diabetic. He put them on a low carbohydrate diet and induced labor early, before the fetus had grown too large. The babies were treated as premature infants.

Six treated women later had children, all living. Two other women suspected of being pre-diabetic did not return to the clinic when they became pregnant again, and both produced stillbirths.

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ROCKETS AND MISSILES

Polaris Is Missile Trump

POLARIS, America's trump in the deadly missile game, is no mere missile. It is an enormously complex missile system.

The instrument itself is a 30-foot, solid-fueled, submarine-launched rocket that can leap out of the water and streak 1,500 miles to its target carrying an atomic warhead.

The Polaris system represents the work of many prominent men.

Rear Adm. Hyman C. Rickover, father of the world's first atomic submarine Nautilus, saw the atomic submarine's potential as a missile base capable of remaining submerged and hidden for long periods of time in enemy waters.

In 1954, Adm. Rickover formally proposed a Polaris-like system. But the Nautilus had just been launched and was not yet proved and missiles were unreliable. The Rickover proposal was shelved.

Later, the reduction of the size of megaton bombs and improvements in missile thrust and guidance reduced objections to the concept of submarine-launched missiles.

In 1955 at Dr. Wernher von Braun's headquarters in Huntsville, Ala., the Army and Navy joined in work on a 1,500-mile missile. The Navy, however, began to fear liquid-fuel missiles were too dangerous for submarine use.

Potentially simpler and safer than liquid-fuel rocket engines, solid-fuel rockets were far from perfected. The solid-fuel rocket was in some ways as fool-proof as a Fourth of July rocket which it resembles. But thrust per pound of fuel was low. A missile with enough fuel to go 1,500 miles was much too big for a submarine to carry.

A chemist whisked out of Germany after World War II, Dr. Karl Klager, attacked the problem for Aerojet-General Corporation of Azusa, Calif., a subcontractor of the Lockheed Missiles and Space Division, which then had the Navy's prime contract for Polaris development.

Dr. Klager's team not only increased thrust per pound, it also hit on a crucial (and top secret) system of cutting off the thrust at just the right time. This cut-off must be exactly timed if the missile is to be at proper altitude and on proper course to begin the long, unguided glide to its target.

Polaris was taking shape as a compact missile about 30 feet long. Through its solid fuel, a star-shaped hole was cast to afford a larger burning surface and improve the missile's performance. A synthetic material from which foam rubber is made was found to bind the fuel together.

Meanwhile, the Massachusetts Institute of Technology and General Electric Company worked on the guidance system. A missile computer was developed into which target and navigational data are fed just before the missile is launched.

To supply the missile's "brain" with precise information on the submarine's position, a new navigational system had to be devised.

Underwater launching also posed problems. The Navy did not want the missile to ignite until the missile was away from the submarine. A misfire might destroy a whole sub and its crew.

A compressed air system was devised. It can shoot the missile 50 to 100 feet into the air from a submarine far below the surface of the ocean. Then the missile engine ignites.

Today, the system seems ready. Beginning next fall a U.S. Polaris submarine with 16 Polaris missiles should be sailing at all times.

One Polaris missile could destroy a city the size of Washington, D.C.

The Navy expects to increase the Polaris range to 3,000 miles. And it plans a fleet of 45 Polaris submarines costing $100,000,000 each. Appropriated for the development of the Polaris system through June of this year: $2,742,648,000, or about $15 for every man, woman and child in the United States.

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METEOROLOGY

Light or Heavy Rainfalls Recur on the Same Dates

LARGE AND SMALL amounts of rain seem to fall on certain dates year after year, a survey shows.

Glenn W. Brier of the U. S. Weather Bureau reported that three series of weather records show a pattern of recurring high or low amounts of rainfall on the same calendar dates.

By comparing the days in the three series that coincided as having high, low or normal rainfall on the same dates, it was found that the three series were related. Mr. Brier said that there was less than one chance in a hundred that the recurring rainfall pattern found over the years could be accidental.

One series studied contains the records of world rainfall from several hundred stations for the period of 70 years between 1880 and 1950. These data were collected by Dr. E. G. Bowen, chief of the radiophysics division, Commonwealth Scientific and Industrial Research Organization, Australia.

The second series covers the daily rainfall from 150 weather stations in the U. S. between 1952 and 1957.

The third series shows the average daily rainfall amounts from the same U. S. weather stations during 1958.

Mr. Brier said that either or both of two factors might cause this pattern of unusual rainfall on certain dates. First, it could be due to the internal mechanism of the earth's atmospheric system.

Secondly, extra-terrestrial causes such as meteoritic dust coming into the atmosphere on certain dates each year might influence the rainfall pattern. This hypothesis was first proposed by Dr. Bowen.

The study was sponsored jointly by the U. S. Weather Bureau and the National Science Foundation.

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BACTERIOLOGY

Protects in Biological War

Two vaccines have been reported. One will protect against tularemia; the other will help animals fight botulism. Fungi that may rid animals of worms were also reported.

THE UNITED STATES has taken another step toward protecting itself against possible biological warfare attacks by developing a potent, live vaccine that can be inhaled to give protection against tularemia, or rabbit fever.

Dr. H. T. Eigelsbach of the U. S. Army Biological Warfare Laboratories told a meeting of the Society of American Bacteriologists in Philadelphia that the inhalable, or aerogenic, form of the vaccine gives greater immunity than does the injected form.

In tests with human volunteers the injected form has proved more potent than any other tularemia vaccine available.

The aerogenic vaccine, tested in guinea pigs and monkeys, not only provided protection against catching tularemia by inhaling it, but also gave greater protection against infection by skin contact.

The human victim of tularemia, which can be fatal to man, is usually infected when he handles a sick rabbit or when he is bitten by an infected tick or deer fly.

Giving the new vaccine to laboratory workers, hunters and persons living in tick-infested areas will cut down the number and severity of tularemia cases, Dr. Eigelsbach said.

The medical research leading to this important observation was performed by Dr. Eigelsbach, J. J. Tulis, and W. R. Griffith of Fort Detrick, in collaboration with Lt. Col. E. L. Overholt, of the U. S. Army Medical Unit at Fort Detrick, Md. (now stationed at the Walter Reed General Hospital). Fort Detrick is an installation of the U. S. Army Chemical Corps.

Science News Letter, May 14, 1960

Botulism Vaccine Tested

THE DEVELOPMENT of a vaccine that can protect animals in epidemic outbreaks of botulism was also reported at the Society of American Bacteriologists meeting in Philadelphia.

Botulism is caused by the toxin produced by the bacterium *Clostridium botulinum*. It affects man, domestic animals and wildlife, and is nearly always fatal. Seven ounces of the poison is said to be enough to wipe out half the population of the world.

Occurrences of botulism in man are sporadic and are usually due to improperly processed canned foods. Outbreaks of the disease in cattle, mink and poultry, however, are more common and of great economic importance in such industries. Recently an epidemic of botulism killed 8,000 pheasants in New York State.

Dr. Daniel A. Boroff of the New England Institute for Medical Research and James R. Reilly of the Conservation Department of the State of New York have developed a vaccine that will protect pheasants against 3,000 times the dose of toxin ordinarily considered fatal. In two experimentally induced epidemics, 72% of non-immunized birds died while only 20% of the immunized birds died.

The two scientists believe their vaccine is sufficiently effective to be used in routine immunization of pheasants and that, with little modification, it could be used in other animals as well.

Science News Letter, May 14, 1960

Fungi Can Kill Worms

JUST AS THE VENUS flytrap plant captures and digests insects, so certain types of fungi can capture, kill and consume parasitic worms.

Research aimed at putting this phenomenon to work to rid animals of worm infestation was described at the Society of American Bacteriologists meeting in Philadelphia by Dr. Waldimero Coscarelli of Rutgers University.

Dr. Coscarelli identified the worms that can be destroyed by fungi as nematodes. These include certain types of both roundworms and threadworms.

The fungi are not difficult to breed under laboratory conditions, he said. But in order to harness their worm-destroying property, it will first be necessary to select a species that can be grown in quantity, be controlled and be harmless to animals and man.

One possibility, the researcher said, is a species called *Arthrobotrys conoides*, which appears to be similar to other fungi until nematodes are added to culture media.

Science News Letter, May 14, 1960

BIOLOGY

Wastebaskets Used As Miniature Ponds

THE POLYETHYLENE wastebasket has found a new use in the study of lakes. It is being used to create small ponds within a larger one. This enables the biologist to test natural observations experimentally.

An ever-increasing demand for food to feed the world's exploding population may be met by intensive farming of ponds since they provide the most intensive means of agriculture at man's disposal. Large yields of food from ponds are achieved only through continuous application of plant fertilizers, much more often than is necessary on crop land. In soils and water there are substances present which precipitate plant nutrients. In soils the roots of the plant come in contact with the precipitated nutrients and redissolve and absorb them, but in ponds the plants are microscopic and suspended in the water while the nutrients lie on the bottom out of the plant's reach.

As a result continuous addition of nutrients, although inefficient, is necessary to supply the demands of the plants. Dr. Raymond G. Stross and Grover Butz of the University of Maryland are using miniature ponds to search for efficient ways of preventing precipitation of plant fertilizers.

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FARMING PONDS—In experiments of food-farming of ponds, Dr. Raymond G. Stross and Grover Butz of Maryland University use polyethylene wastebaskets as ponds within ponds.

AGRICULTURE

On Return From Abroad, Bring No Meats or Plants

IF YOU ARE planning to go abroad, do not bring home any plants, bulbs, fruits or meats.

These and a number of other agricultural products you might care to bring back may be confiscated and destroyed by plant and animal quarantine inspectors of the U. S. Department of Agriculture's Agricultural Research Service.

Imports of agricultural products are regulated to prevent possible introduction into the United States of destructive disease-producing agents and insect pests.

Last year, the USDA said, 63% of all plant materials intercepted for violation of quarantine regulations were taken from incoming tourist luggage—21,000,000 pieces of it.

Inspectors found that an average of one in every 66 pieces of incoming luggage contained contraband plant material. They estimate that in port-of-entry inspection an important crop pest from abroad is intercepted every 20 minutes during a working year. Some of these pests may never before have been found in this country.

Similarly, nearly 65,000 pounds of prohibited meat products were confiscated from passenger luggage last year. Some came from countries where foot-and-mouth disease or rinderpest exist. These are serious livestock diseases that do not occur in the U. S.

Private importation of agricultural products for special purposes is possible under a permit, USDA officials point out. Such permits should be obtained, before leaving this country, from the Agricultural Research Service.

Science News Letter, May 14, 1960

ASTROPHYSICS

Many Questions as to How Sun Affects Earth

WHAT GOES ON between the earth and the sun still remains much of a mystery, despite rocket and space probes.

There are many, often contradictory, theories concerning how much of the sun's mighty outpouring of radiation affects earth, and the other solar system planets.

Scientists know the sun is essential to any form of earthly life, but they do not agree on how the first living forms started, nor even about how the sun and its system of planets came into existence.

And concerning the more subtle effects such as the behavior of solar particles trapped in the earth's magnetic field, the exact cause of auroras, the occurrences of sudden disturbances in the earth's ionosphere, there is even less agreement.

The broad band of solar radiation has been available for study from above most of the earth's atmospheric blanket by rockets only in the last 15 years or so. With the launching of satellites and space probes, a new picture is beginning to emerge and many old theories have been discarded.

It has long been known that the space between the earth and sun contains minute particles of matter—the so-called cosmic dust, cosmic rays, comets, magnetic fields, solar radio waves and many other kinds of electromagnetic radiation, including light.

At the present time, it seems that many of these factors react with each other in a far different and more complicated manner than was believed before they were studied directly. Simultaneous measurements from a satellite circling close to earth, for instance, and one of the two tiny artificial planets the United States has sent circling the sun, indicate that there is a direct correlation between changes in the magnetic field some five million miles from earth and close to the earth's surface.

This means there are sun-caused electromagnetic storms in deep space as well as near the earth. Among the observable earthly effects of such storms are auroras, blackouts in shortwave communications by way of the ionosphere, disturbances in the magnetic field and a decrease in the intensity of cosmic ray bombardment.

Science News Letter, May 14, 1960

PHYSICS

Scientist Seeks to Tag TB Germs by Chemistry

BY ANALYZING the inherent chemistry of tuberculosis germs using modern laboratory methods, it may be possible soon to identify all strains of the bacilli quickly and easily.

Dr. H. M. Randall said at the American Physical Society meeting in Washington, D. C., that some chemical compounds have been identified in laboratory experiments using chromatography and infrared spectroscopy.

The trick now becomes that of finding chemical compounds that always show up in specific strains of the germs.

The University of Michigan physicist said it may even be possible to find in each strain a single chemical compound not found in other strains.

Some strains at present lack properties that positively identify them. Discovery of specific compounds for these strains "would not simply add another method of identification but would be the only method," he said.

Science News Letter, May 14, 1960

RADIO

Low Frequency Signals Give Very Accurate Time

BROADCASTING on the very low frequency of 20 kilocycles, a radio station operated by the National Bureau of Standards, Boulder, Colo., is now transmitting the world's most accurate yardstick of radio frequency.

Within their range of thousands of miles, the signals will be used for research necessary to set up a world-wide broadcasting system of transmissions at the same low frequency for use by industrial and Government agencies requiring very accurate timing. Lowest frequencies picked up by a home radio are about 560 kilocycles.

Science News Letter, May 14, 1960

IN SCIENCE

TECHNOLOGY

Meter Measures Protein In Quick and Easy Glance

A FAST and easy-to-use device for determining the protein content of milk has been developed in Russia. It also "sees" proteins in samples of blood, lymph, urine and spinal fluid, and can estimate the presence of proteins in meat and wool.

The small "proteinmeter of fluorescence" has been built at the All-Union Institute of Cattle-Breeding by I. Kesunin and S. Konev, it was reported in a Soviet monthly magazine.

The device works because proteins glow under ultraviolet light. This glow, however, is not visible to the human eye. A special glass, called uranic glass, transforms the ultraviolet luminescence into visible light.

The brightness of the luminescence is measured with a light-sensitive electronic "eye" and converted into a reading on a sensitive ammeter.

To determine the protein content of milk, for instance, the milk is diluted 20 times and a small sample is taken. The protein content in milk with this method may be determined to within 0.1%.

Science News Letter, May 14, 1960

ENGINEERING

Steam-dug Wells to Give Water for Men in Ice Cap

SOLDIERS and scientists who will spend next winter in Greenland's ice cap will drink water from wells drilled through snow and ice with steam. The U. S. Army Engineer Research and Development Laboratories at Fort Belvoir, Va., developed the new method.

Previously water was obtained by melting snow and ice, but this was costly and surface snow might be contaminated. With the new system, a bit using steam at 377 degrees Fahrenheit drills to about 150 feet or until homogenous ice structure is reached. Then a second bit that shoots jets of steam sideways is used to melt a bell-shaped reservoir up to 50 feet in diameter, from which water is pumped.

The well system will be used for Camp Century in which, for the first time, men will spend the winter months buried in the Greenland Ice Cap. To build Camp Century, snow plows dig tunnels which are roofed with steel arches and covered with snow. Prefabricated buildings are then assembled within the tunnel.

To supply steam, a portable generator made by Vapor Heating Corporation of Chicago for steam cleaning heavy railroad equipment will be used. Wells that have been pumped dry may be used to store foods, gasoline and machinery.

Science News Letter, May 14, 1960

E FIELDS

MEDICINE

Sore Throats Dangerous To Hemophilic Patients

A SORE THROAT or a toothache can mean serious trouble or death for the person with hemophilia, or bleeders' disease.

R. A. L. Leatherdale, consultant anesthetist for hospitals in Bournemouth and East Dorset, studied 12 hemophiliacs admitted to hospitals because of swellings in the neck or mouth region. The swelling was caused by bleeding inside the tissues.

In a typical case, blood backed up into the gums and the tongue; in a few hours or days swelling became so great that the air passage was blocked or restricted. Doctors were usually able to correct such conditions by inserting a breathing tube and giving fresh blood or plasma. But there was one death among the 12 patients studied.

There seemed to be no one factor that caused bleeding to begin in the first place, Mr. Leatherdale reported in the British Medical Journal, April 30. In one case the patient bit his tongue, in four cases sore throat was a factor, in two cases the cause was related to dental condition, and in five the cause could not be determined.

The slightest damage will start bleeding in the hemophiliac and such persons have to be careful not to shout too much lest this cause enough throat damage to start bleeding.

Science News Letter, May 14, 1960

MEDICINE

Doctor Takes Long Look At Treatment of Obesity

IF A FAT person cannot stick to his diet, the only sure-fire way to lose weight is to go to a hospital where he cannot cheat on calorie intake.

In re-examining 161 obesity studies reported in the last 30 years, Dr. Alvan R. Feinstein of New York University College of Medicine has found that only those patients who were in a "completely restricted environment" (usually a hospital) always lost weight proportional to the prescribed calorie cut.

No other method, whether a special diet, pills, injections, group therapy or individual psychiatric help, has worked so consistently, Dr. Feinstein reports.

The old idea that obesity is due to an endocrine disorder and that injections of hormones would make reducing easier has almost become obsolete. There is now ample evidence that almost no obese patients have any "discernible primary hormonal imbalances" and that any loss of weight associated with hormone treatment is due to the simultaneous use of diet.

Misconceptions such as the endocrine disorder theory get started and keep going when research workers give incomplete reports and use false logic to arrive at conclusions, Dr. Feinstein reports in the Journal of Chronic Diseases, 11:349, 1960.

A number of the reports studied claimed success during the first two months of dieting, when weight reduction is greatest. They then failed to indicate what happened later—whether the patients reached the desired weight or whether the particular method in question could be used effectively for long-term dieting.

Most overweight persons need some sort of watchdog to keep an eye on them. In many cases the doctor considers such people a bore. He admonishes them for being fat, gives them a calorie chart, and tells them to eat only so many calories per day.

This attitude has opened the door for non-medical solutions to overweight. Although commercial routines and prescriptions are usually based on reasonably sound knowledge, they are not geared to individual needs. Dr. Feinstein reports the obese person is chronically ill and should be treated accordingly.

Science News Letter, May 14, 1960

PHYSICS

Control System Starts Reactors Automatically

ATOMIC REACTORS can now be started up automatically with a new push-button control system.

Developed by Minneapolis-Honeywell Regulator Company's Brown Instrument Division in Philadelphia, the system controls the rate of fission (the splitting of atoms by neutron bombardment) during the entire period of reactor operation.

It was designed for the Atomic Energy Commission's experimental Plutonium Recycle Test Reactor (PRTR) now being built at Hanford, Wash., but can be adapted to any kind of reactor.

Development of the system grew out of the fact that manual control of moderator level in a reactor is extremely difficult. Also, a reactor of this type must achieve power rapidly if costly delays are to be averted.

The system is a two-phase push-button operation. First, the rate of fission is mathematically computed and controlled by special instrumentation which issues its own control signal. Once the reactor reaches a level of two megawatts, the operator, in the second phase, can raise power to any preset level up to 70 megawatts.

Science News Letter, May 14, 1960

EDUCATION

Fewer Farm Youths Plan to Go to College

ONE-THIRD of this year's high school seniors who live on farms definitely plan to attend college in 1960, a survey by the Bureau of Census of the Department of Commerce shows. City seniors do better; half plan for college. The survey also shows a larger percentage of city youths finish high school than do farm youths.

Science News Letter, May 14, 1960

BACTERIOLOGY

Survival of Fittest in Cell Immunity to Bacteria

SURVIVAL of the fittest may explain the immunity to bacteria exhibited by certain cells of the body, it is suggested by experiments by Dr. Eric L. Nelson and R. S. Berk, bacteriologists at the University of California, Los Angeles.

Their studies indicate that a resistant population of cells does not develop in an immunized animal through a direct alteration of existing cells causing them to become more resistant.

Rather it develops through a selective process in which all cells sensitive to the bacterial toxins are destroyed during immunization, and those which are naturally more resistant survive.

The investigators worked with a type of bacteria known as *Pseudomonas aeruginosa*. These bacteria cause infections of the eye, middle ear, urinary tract and burns.

The bacteriologists were primarily interested in effects of the bacteria on defense cells of the body which are produced by the liver, spleen and lymph nodes.

It is thought that the toxic substances produced by these bacteria act on a particular cycle in cell chemistry, perhaps the enzymes involved in this cycle. Radiation is thought to act on the same cycle.

It was found that defense cells from immunized animals, whether irradiated or not, destroyed Pseudomonas bacteria, while those from non-immunized animals lost their bactericidal activity following irradiation.

The same survival of the fittest cell mechanism is believed to be involved in problems of drug resistance of organisms.

Science News Letter, May 14, 1960

CHEMISTRY

"Mothball Fleet" Coating To Protect Museum

A SPECIAL PLASTIC coating used to "mothball" much of the U. S. fleet is also being used to protect the Guggenheim Memorial Museum in New York.

The coating is jointless, fills the hairline cracks characteristic of poured concrete surfaces, and expands and contracts with the structure itself. It provides a waterproof, abrasion-resistant surface, protecting the museum from erosion by wind, water, air pollutants and changing temperature.

Developed by the R. M. Hollingshead Corporation of Camden, N.J., it has been used to preserve stored ships, gun positions and other military equipment as well as to coat interiors of textile plants and pulp mills where acids and high humidity create exceptional corrosion problems.

Actually a series of coats, the coating includes a strongly adhesive primer, to make it adhere well to the building surface, and an outer coat of great cohesive strength, which means that it will hold together well under stress. It does not oxidize or erode, and architects predict that it will give the museum at least 10 years' service before any recoating is required.

Science News Letter, May 14, 1960

PUBLIC SAFETY

Your Cellar Could Mean Your Life

Here are some simple but life-saving steps that the ordinary housewife can take to protect her family from major destruction by nuclear blasts, floods or tornadoes.

WHAT WOULD YOU DO right now, as you are reading this very print, if you heard a siren signaling an actual enemy attack? Chances are you would look up from the newspaper, ponder for a moment, then continue reading.

But it would not be very long before you, and millions of Americans just like you, would panic. The panic would result from frustration based on a feeling of helplessness. You might not know what to do.

On the other hand, some Americans would know what to do and would be busy doing it before the last blast of the warning alarm. And they would be doing things that every person can do with just a little planning and careful thought.

If you have ever camped out doors, or for that matter, even just packed the trunk of your car for a vacation, you can rapidly learn how to provide for your family in any disaster emergency.

Here are the recommendations of the Office of Civil and Defense Mobilization:

First of all, determine which is the safest area of the house. Usually, it is the basement. Civil defense officials have plans available for building a shelter with concrete or sandbagged walls and ceilings. Such shelters provide protection from fallout and radiation.

Concrete, bricks, sand or earth, are heavy enough to afford protection by absorbing radiation. Eight inches of concrete will shield as adequately as 12 inches of earth, 16 inches of books or 30 inches of wood. These thicknesses would offer ample protection in most of the country except those areas hit by the heaviest fallout.

"Do It Yourself" Shelters

The shelters themselves can be built by homeowners. Basement shelters are generally the least expensive, ranging in price from $150 to $200. Plans are also available for shelters that can be built by those who do not have basements available to them.

However, for the family caught without a shelter, the ground floor of a dwelling offers some protection. The radiation on the ground floor would be half the amount outdoors.

But a shelter is no good unless its occupants keep strict sanitary rules. Impure water and unsafe food can cause illness or even death. Garbage and human wastes can help spread disease if not disposed of properly. It is important to keep clean and to keep the home clean. Yet most persons take for granted the public services that now guard families against infections of all kinds.

Many of these public services might be temporarily knocked out by an enemy attack or natural disaster. If local water utilities are damaged, household water supplies would be cut off until repairs could be made. If sewer mains were broken, it would not be possible to dispose of human wastes in the usual manner. Lack of garbage collection and garbage disposal service would encourage the increase of rats, flies, and other disease-carrying agents.

Both garbage and human waste must be disposed of. Water flush toilets cannot be used when water service is interrupted. The water remaining in the fixture will not be enough to flush the wastes down the sewer and clogging could result. Besides, all available water may be necessary to fight fires.

Nonetheless, some provisions can be made. Almost any metal covered container or pail will suffice. Human waste can be stored in a 10-gallon garbage can until it can be buried. Garbage must be handled in a like manner, and disinfectant should be used generously at all times.

It is a known fact that humans can survive a considerable period of time without food. But every person needs safe water to drink. Not only could water supplies be interrupted as a result of a major disaster, but sewage, chemicals, radioactive materials or even disease-carrying organisms from biological warfare could leak into water pipes. If household pipes were broken, homeowners would shut them off or civil defense authorities might request that they be shut off to maintain fire-fighting pressures in some other part of the city.

However, an adequate supply of water can always be maintained by storing at least seven gallons of water or other fluids for each member of the family. This may sound like a great deal of fluid to attempt to store, but there are usually on hand, in each home, fluids other than water that can be used for drinking purposes such as fruit juice, soft drinks and liquids from water packed fruits and vegetables.

Store Water Safely

Water can safely be stored in glass jugs with tight-fitting covers or stoppers. Fruit jars, quart bottles or other types of glass containers will do just as well, however, It is not necessary to boil water before storage. Fresh tap water is safe provided the containers are clean.

These containers should be packed tightly to avoid damage by blast or shock. Wadded newspapers, excelsior or other packing material can be stuffed between the jars.

Every three months the complete water supply should be changed. Empty the containers, rinse them, and refill with fresh water.

Emergency sources of drinking fluids can be found in citrus fruits that have been

HOME WITHIN A HOME. This may not be your idea of how to live, but these provisions in a homemade shelter may save the lives of your family. Knowing what to do and when are important points that discourage the development of panic, as this posed picture by the Office of Civil and Defense Mobilization demonstrates.

covered. If they have been exposed to radioactive dust, they should be peeled before squeezing, while fruit such as apples and peaches should always be peeled. Another source of water is the ice in the refrigerator and the water in the storage tanks of hot water heaters.

Tap water should not be used immediately following an attack. Questionable water supplies should be treated by boiling for five minutes, adding chlorine or any household bleach that contains hypochlorite, purification tablets or iodine. Emergency water rations may be delivered to distribution points in neighborhoods, or well supplies may be tapped for purification.

The preservation of food supplies requires different precautionary measures. The contents of jars, cans, cartons and other food packages that have not been broken by a nuclear blast would be perfectly safe to eat. However, it would be wise to wipe or wash carefully any can, bottle or other containers, or any covered dish, that has been exposed to radioactive "mist." Radioactive dust on cooking utensils is another problem. Such dust cannot be made harmless by boiling or by the use of soap and water. Washed-off particles will still be "hot" and will remain in the wash water and on cleaning cloth.

An adequate food supply for any disaster should include enough food for a family for two weeks. It should consist of foods regularly eaten by the family. For example, children, the aged and the ill need milk and other foods that are easily digested. Large supplies of canned fruits and vegetables should be substituted for fresh foods that will spoil quickly in the event of refrigeration failure. Powdered, evaporated or condensed milk may be substituted for fresh milk.

Supplies should consist of those foods that do not need refrigeration and which can be eaten without cooking, if necessary. This might include canned fruits, fruit juices, vegetables, soups, milk, fish, meat, and baby foods as well as packaged cereals and dried foods.

Before an attack occurs, the Office of Civil and Defense Mobilization urges every citizen to plan for any major disaster by providing the following:

1. Seven gallons of water or other liquid for each person in the household.

2. A two-week supply of proper foods, paper plates and napkins.

3. Cooking and eating utensils, measuring cup, can and bottle openers, pocket knife and matches.

4. Special food for babies and the sick.

5. Large garbage can, smaller one for human waste. Also a covered pail for bathroom uses, toilet tissue, disposable diapers, soap.

6. Rubber sheeting and special equipment for the sick, as well as sleeping accommodations for all.

7. Grocery bags, week's supply of newspapers for sanitary uses, waterproof gloves, two pints of household chlorine, a wrench, screwdriver and shovel.

Complete information on preparing for a major disaster can be purchased through the Superintendent of Documents, U.S. Government Printing Office, Washington 25, D.C.

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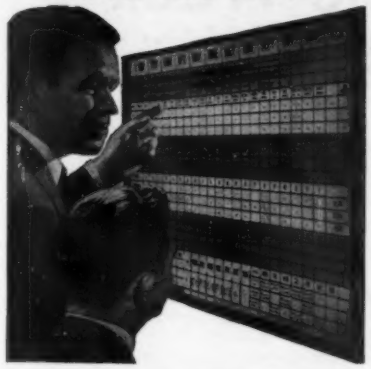

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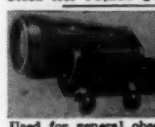

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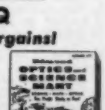

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AEDES AEGYPTI (L) THE YELLOW FEVER MOSQUITO: Its Life History, Bionomics and Structure—Sir S. Rickard Christophers—*Cambridge Univ. Press,* 739 p., illus., $14.50. Systematic reference work of all that is known about the species.

THE ANATOMY OF PSYCHOTHERAPY: Systems of Communication and Expectation—Henry L. Lennard and Arnold Bernstein with others—*Columbia Univ. Press,* 209 p.. $6. Provides a picture of the structure of therapeutic communication.

ANIMAL CAMOUFLAGE—Adolf Portmann—*Univ. of Mich. Press,* 111 p., illus., paper, $1.95. Ann Arbor Science Paperback.

APOLOGIES TO THE IROQUOIS—Edmund Wilson, with a Study of the Mohawks in High Steel by Joseph Mitchell—*Farrar, Straus,* 310 p., illus., $4.95. Describes observations while exploring the contemporary world of the Indian tribes north and south of the Canadian border.

ATOMIC AND NUCLEAR PHYSICS—Robert S. Shankland—*Macmillan,* 2nd ed., 665 p., illus., $8.75. Completely revised text for undergraduate physics majors and first-year graduate students.

THE BIOSYNTHESIS AND SECRETION OF ADRENOCORTICAL STEROIDS—J. K. Grant and F. Clark, Eds.—*Cambridge Univ. Press,* 112 p., illus., $5. Biochemical Society Symposium No. 18, London, 1959.

BIRDS OF ANAKTUVUK PASS, KOBUK, AND OLD CROW: A Study in Arctic Adaptation—Laurence Irving—*Smithsonian Inst. (GPO),* 409 p., illus., paper, $2. Based on a 12-year study of adaptations to life in arctic Alaska.

EDUCATION AND FREEDOM—H. G. Rickover—*Dutton,* 332 p., paper, $1.45. The Admiral's speeches and testimony before Congress, demanding higher standards in American education.

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GENETICAL RESEARCH, Vol. I, No. 1—E. C. Reeve, Ed.—*Cambrige Univ. Press.* 172 p., illus., paper, $7, 3 issues annually, $17.50. Publishes original work on all aspects of genetics, or in any field of research which has important bearing on genetics.

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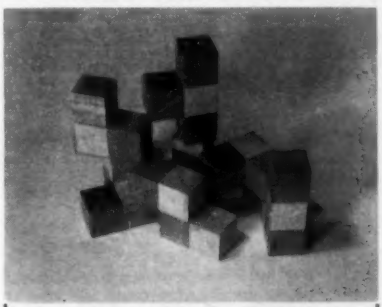

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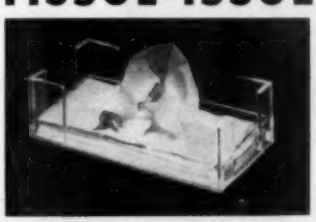

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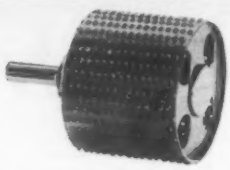

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Science News Letter, May 14, 1960

Do You Know

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Questions

BACTERIOLOGY—How many pheasants died from botulism in New York State recently? p. 311.

ENGINEERING—How deep will the well to be drilled under Greenland's ice cap be? p. 312.

ROCKETS AND MISSILES—The Saturn rocket is expected to be tested in flight in how many years? p. 306.

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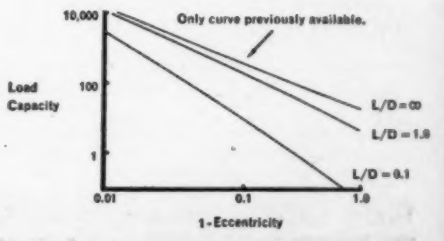
General Motors Research Laboratories

Warren, Michigan

Hydrodynamic analyses have led to specific answers about bearing operation. Shown here are the oil pressure distribution (main illustration) and load-carrying capacity for a non-rotating journal with a reciprocating load.



New Machines and Gadgets

For sources of more information on new things described, send a self-addressed stamped envelope to SCIENCE NEWS LETTER, 1719 N St., N.W., Washington 6, D. C., and ask for Gadget Bulletin 1039. To receive this Gadget Bulletin without special request each week, remit $1.50 for one year's subscription.

LAWN SPRINKLER looks a bit like a four-petal, metal flower. But each lily-like petal is a baffle that can be raised or lowered for any spray pattern desired. Thus, you can spray a full circle, a half-circle, a quarter-circle or a narrow strip. Large flared-edge circular base slides smoothly over the lawn.

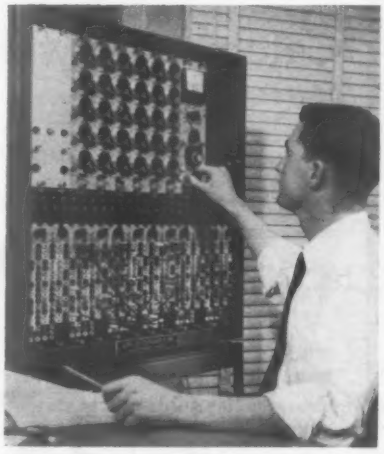
Science News Letter, May 14, 1960

PICNIC BOX-TABLE. Carry your family's picnic to the beach in this handy box. Unfold the four steel legs of the box and remove the box lid. Then the sides fold down and you have a table for four. The box is covered inside and out with washable plastic. The plastic on the inside, or table top, has a gay, checkerboard pattern.

Science News Letter, May 14, 1960

DRAPERY HANGING AID, a strip of nylon plastic with holes in it, may be sewn into the top of your drapes. Drapery hooks fit into the holes so that the drapes hang evenly. Since the hooks never touch the fabric, there are no holes, rips or tears.

Science News Letter, May 14, 1960



DESKTOP COMPUTER, shown in the photograph, about the size of a TV set, is designed for small engineering and research firms. If the firm grows and its problem-solving needs increase, this electronic computer can grow too. Additional components simply plug in until the desktop model becomes a complex floor model.

Science News Letter, May 14, 1960

REFRIGERATION UNIT of the do-it-yourself variety lets you convert an ice chest into a refrigerator for your boat or camping trailer. If you are handy, you can make the conversion without special tools in about four hours. The unit operates from a 12-volt auto storage battery and takes up less room than a 25-pound block of ice.

Science News Letter, May 14, 1960

ROUND HAND FILE can enlarge holes and cut decorative patterns in wood, aluminum, plastics, plywood and asphalt tile. It features self-cleaning, individually hardened cutting teeth.

Science News Letter, May 14, 1960

FAUCET SEAT REFACER. When your faucet leaks because its valve seat needs resurfacing, this simple refacer will scrape off pitted areas and give the valve seat a smooth surface. You simply remove the faucet's handle, insert the refacer as directed and rotate it.

Science News Letter, May 14, 1960

BAIT BUCKET features a built-in air pump for aerating the water in the bucket. By using the pump every 12 to 24 hours, a fisherman can help keep his bait alive and healthy. A safety valve prevents over-pumping. The aluminum bucket holds up to 120 live minnows and it floats.

Science News Letter, May 14, 1960

Nature Ramblings

The Muskrat

MUSKRATS are pretty much "lone wolves" for, as a rule, they like to live alone except for their brief period of family life or when they find it too cold to sleep alone.

They build their hummocks of grasses, twigs, leaves and mud throughout most of the country with the exception of parts of Florida, Texas and California. Wherever there is still or slowly moving water, fresh or salt, the muskrat makes its home. This may be along the margins of streams and ponds, in inland swamps and coastal marshes.

Unlike their larger cousins, the beaver, muskrats do not build elaborate dams to regulate the water supply. They make the best of what they find available and often settle close to towns if food and water are abundant.

The muskrat has long sharp claws and its hind feet are longer than its forefeet and partly webbed. It moves rather awkwardly on land and thus offers an easy prey for hawks, owls, snapping turtles, foxes, raccoons, weasels and coyotes. But it will always defend itself savagely if cornered.

In the water, however, the muskrat is far more agile. It is an excellent swimmer and a fast and silent diver. This is fortunate for, even in the water, it has to be on the alert for enemies among such equally good swimmers as the mink and the otter.

Mainly a vegetarian, the muskrat finds its food both in the water and on the land. Succulent aquatic plants like cattails, flags and lily pond roots are preferred, but other plants and bushes growing near the hummocks are also eaten.

Whenever they are available, the muskrat enjoys eating shellfish, salamanders and frogs, and even small fish. Clams and mussels, which it opens by biting the tough ligament at the back of the shell or by prying the shell apart with its teeth, are the favorites.

In the south, the muskrat breeds all year round, while in the north, it breeds from spring to autumn. In either case, it has several litters annually. Litters may number from three to 11, averaging three or four in the south and five or six in the north.

More than 10,000,000 muskrat pelts come to market each year, 3,000,000 from Louisiana alone. This, together with the fact that the carcasses are sold for meat ("marsh rabbit" or "marsh hare") in some areas, makes the muskrat one of the most useful of small American mammals.

Science News Letter, May 14, 1960